

**AMENDMENTS TO THE CLAIMS**

Please amend the claims as follows.

1. A method of approximating an image by decreasing an amount of image data used to create the image, wherein said image data defines a polygonal framework, said framework being composed of line segments drawn between vertices, said method comprising:

evaluating a degree of importance of each line segment of said framework;

removing at least one unnecessary line segment from said framework which is identified based on said evaluation of said degree of importance of each line segment; and

determining a position of a vertex after said unnecessary line segment is removed.

2. The method of claim 1, wherein said image data defines a 3-dimensional polygonal framework.

3. The method of claim 1, wherein said evaluating a degree of importance of each line segment is performed by evaluating an amount by which a volume of the polygonal framework defined by the image data is changed by removal of a particular line segment.

4. The method of claim 3, wherein said evaluating a degree of importance of each line segment further comprises assigning a line segment a degree of importance in direct proportion to the amount of volume change caused by removal of that line segment.

5. The method of claim 1, wherein said evaluating a degree of importance of each line segment is performed using a vector (E) which represents a particular line segment, an area (A) of a polygon within said polygonal framework wherein said particular line segment is a side of said polygon, and a vector (N) normal to a plane of said polygon.

6. The method of claim 5,

wherein said evaluating a degree of importance of each line segment further comprises calculating an importance of a particular line segment by  $(N \cdot E) \times A$ ,

wherein E is said vector representing a particular line segment, A is said area of a polygon sided by said particular line segment, and N is said normal vector.

7. The method of claim 1, wherein said evaluating a degree of importance of each line segment is performed based on an amount by which an area of said polygonal framework defined by said image data is changed by removal of a particular line segment.

8. The method of claim 7, wherein said evaluating a degree of importance of each line segment further comprises assigning a degree of importance to a particular line segment in direct proportion to said amount by which said area of said polygonal framework is changed by removal of that line segment.

9. The method of claim 1, wherein said evaluating a degree of importance of each line segment is performed based on a length of a particular line segment and an area of a polygon within said polygonal framework of which said particular line segment is a side.

10. The method of claim 9, wherein said evaluating a degree of importance of each line segment further comprises calculating a sum of results of an equation  $|E| \times A$  for polygons sided by said particular line segment, wherein " $|E|$ " is length of that line segment, "A" is an area of a polygon sided by said particular line segment.

11. The method of claim 1, wherein said evaluating a degree of importance of each line segment is performed based on a length of said line segments.

12. The method of claim 11, wherein said evaluating a degree of importance of said line segments further comprises assigning a degree of importance to each line segment in direct proportion to a length of that line segment.

13. The method of claim 1, wherein if two or more line segments are assigned an identical degree of importance, said method further comprises assigning a lowest degree of importance among said two or more line segments to that line segment of said two or more line segments with a shortest length.

14. The method of claim 1, further comprising repeating said steps of evaluating a degree of importance of each line segment; removing an unnecessary line segment; and determining a position of a vertex after said unnecessary line segment is removed.

15. (Amended) The method of claim 1, wherein said evaluating a degree of importance of each line segment is performed based on an amount by which [an amount of] said image data is changed by removal of a particular line segment.

16. The method of claim 1, wherein said evaluating a degree of importance of each line segment is performed based on importance values assigned by a user to one or more of said line segments.

17. The method of claim 16, further comprising specifying one or more of said line segments as of high importance, wherein said evaluating a degree of importance of each line segment further comprises preventing said one or more high importance line segments from being designated as said unnecessary line segment.

18. The method of claim 1, wherein said determining a position of a vertex after said unnecessary line segment is removed comprises positioning said vertex at said position such that a total loss of area between a framework including said unnecessary line segment and a framework in which said unnecessary line segment is removed is minimized.

19. The method of claim 1, wherein said determining a position of a vertex after said unnecessary line segment is removed comprises positioning a vertex at a position such that a loss of area to said framework caused by removal of said unnecessary line segment is approximately equal for portions of said framework on opposite sides of said vertex.

20. The method of claim 1, wherein said determining a position of a vertex after said unnecessary line segment is removed comprises positioning said vertex at a position corresponding to an end of said removed unnecessary line segment.

21. The method of claim 1, further comprising, generating an intermediate configuration of said image data by decreasing a length of said unnecessary line segment prior to said step of removing said unnecessary line segment.

22. The method of claim 1, further comprising, generating an intermediate polygonal framework between an original framework including said unnecessary line segment and a new framework with said unnecessary line segment removed.

23. (Amended) The method of claim 22, wherein said generating an intermediate framework comprises locating a vertex at [an] a position intermediate to a vertex position in said original framework and a vertex position determined in said step of determining a position of a vertex after said unnecessary line segment is removed.

24. The method of claim 23, wherein said locating a vertex at an intermediate position comprises using a linear interpolation on said vertex position in said original framework and said vertex position determined in said step of determining a position of a vertex after said unnecessary line segment is removed.

25. The method of claim 1, further comprising reconfiguring a texture applied to said framework to account for said removing of said unnecessary line segment.

26. The method of claim 1, wherein said evaluation of a degree of importance of each line segment is based in part on an evaluation of the degree of importance of line segments contiguous to a particular line segment being evaluated.

27. The method of claim 1, further comprising reconfiguring said framework after said unnecessary line segment has been removed by placing a new vertex at said position identified in said step of determining a position of a vertex.

28. The method of claim 27, wherein said reconfiguring comprises using said new vertex to replace a previous vertex located at an end of said unnecessary, removed line segment.

29. The method of claim 1, wherein said evaluating a degree of said line segment is performed on the basis of a removal importance value of the line segment obtained from a change amount of said image data caused by the removing of said line segment and on the basis of an assigned importance value of the line segment assigned by a user.

30. The method of claim 29, wherein said evaluating a degree of importance of the line segment decides that the degree of importance of said line segment is small, if said removal importance value and said assigned importance value are both small.

31. The method of claim 29, wherein said assigned importance value is a removing order of said line segments.

32. The method of claim 17, wherein said specifying the at least one line segment as of high importance is performed by a user.

33. The method of claim 17, wherein said specifying the at least one line segment as of high importance specifies a portion where more than two image data are adjacent.

34. The method of claim 18, wherein when the shape of the portion that includes said unnecessary line segment is a concave or convex shape, said vertex is positioned where said total loss of area is minimized.

35. The method of claim 19, wherein when the shape of the portion where said unnecessary line segment is a S-character shape, said vertex is arranged at a position where a loss of area between said original framework and said reconfigured framework is equal on both sides of said vertex.

36. The method of claim 1, wherein said determining a position of said vertex determines the vertex at a position of one of the vertices of the removal line segment.

37. The method of claim 1, further comprising, generating an intermediate configuration of said image data by decreasing a length of said unnecessary line segment.

38. The method of claim 1, further comprising, generating a framework at an intermediate layer between an original framework which is the polygonal framework before said unnecessary line segment is removed and a reconfigured framework which is the polygonal framework after said unnecessary line segment is removed by determining a position of vertices in the intermediate layer on the basis of the relation of the position of said vertices between said original framework and said reconfigured framework.

39. The method of claim 38, said position of said vertices at said intermediate layer is determined by the interpolation of said position of said vertices in said original framework and said reconfigured framework.

40. The method of claim 39, said interpolation is a linear interpolation.

41. The method of claim 1, wherein said removing of said unnecessary line segment removes either one of two vertices constructing the unnecessary line segment; and wherein said determining of a position of said vertex determines the shift amount of the vertex which is constructing the unnecessary line segment and not removed on said removing of said unnecessary line segment.

42. A method of approximating an image by decreasing an amount of image data used to create the image, wherein said image data defines a polygonal framework formed of polygons to which textures or pictures are applied, said polygons of said framework being composed of line segments connected between vertices, said method comprising:

evaluating a degree of importance of each line segment of said framework;

removing an unnecessary line segment identified by said step of evaluating a degree of importance of each line segment;

reconfiguring said framework to account for said removal of said line segment; and

reconfiguring said textures or pictures applied to said framework to account for said removal of said line segment.



43. The method of claim 42, wherein said reconfiguring the textures or pictures applied to the framework is preformed altering an association between a vertex of said unnecessary line segment and any of said textures or pictures.

44. The method of claim 42, wherein:

said reconfiguring of said framework comprises replacing two vertices of said framework, between which said unnecessary, removed line segment had been connected, with a single new vertex; and

said reconfiguring the textures or pictures applied to the framework comprises determining a new position on said textures or pictures corresponding to a position of said single new vertex in said framework.

45. The method of claim 44, wherein said reconfiguring of said textures or pictures applied to the framework comprises determining said new position by interpolation between two points on the textures or pictures which correspond to the unnecessary line segment.

46. The method of claim 45, wherein said interpolation is a linear interpolation.

47. The method of claim 42, wherein said evaluating a degree of importance of each line segment of said framework further comprises preventing any line segment existing on an outline of any of said textures or pictures from being designated as said unnecessary line segment.

48. The method of claim 42, wherein said evaluating a degree of importance of each line segment of said framework further comprises preventing any line segment, which exists on an outline of any of said textures or pictures from being designated as said unnecessary line segment if a change in an area of said texture or picture resulting from removal of that line segment exceeds a predetermined value.

49. The method of claim 48, wherein said area change amount after the line segment removal is obtained on the basis of a calculation of sum of results of an equation  $| (N \cdot E) \times L |$  at line segments corresponding to the boundary lines of the texture or picture existing before and after the line segment to be removed, wherein "E" is representing that line segment, "L" is a length of line segment corresponding to the boundary lines of the texture or picture, "N" is a normal vector of said line segments, " $\cdot$ " is a inner product, and " $\times$ " is a product.

50. The method of claim 42, wherein said image data defines a 3-dimensional polygonal framework.

51. The method of claim 42, wherein said evaluating a degree of importance of each line segment is performed by evaluating an amount by which a volume of the polygonal framework defined by the image data is changed by removal of a particular line segment.

52. The method of claim 51, wherein said evaluating a degree of importance of each line segment further comprises assigning a line segment a degree of importance in direct proportion to the amount of volume change caused by removal of that line segment.

53. The method of claim 42, wherein said evaluating a degree of importance of each line segment is performed using a vector (E) which represents a particular line segment, an area (A) of a polygon within said polygonal framework wherein said particular line segment is a side of said polygon, and a vector (N) normal to a plane of said polygon.

54. The method of claim 53,

wherein said evaluating a degree of importance of each line segment further comprises calculating an importance of a particular line segment by  $(N \cdot E) \times A$ ,

wherein E is said vector representing a particular line segment, A is said area of a polygon sided by said particular line segment, and N is said normal vector.

55. The method of claim 42, wherein said evaluating a degree of importance of each line segment is performed based on an amount by which an area of said polygonal framework defined by said image data is changed by removal of a particular line segment.

56. The method of claim 55, wherein said evaluating a degree of importance of each line segment further comprises assigning a degree of importance to a particular line segment in direct proportion to said amount by which said area of said polygonal framework is changed by removal of that line segment.

57. The method of claim 42, wherein said evaluating a degree of importance of each line segment is performed based on a length of a particular line segment and an area of a polygon within said polygonal framework of which said particular line segment is a side.

58. The method of claim 57, wherein said evaluating a degree of importance of each line segment further comprises calculating a sum of results of an equation  $|E| \times A$  for polygons sided by said particular line segment, wherein " $|E|$ " is length of that line segment, "A" is an area of a polygon sided by said particular line segment.

59. The method of claim 42, wherein said evaluating a degree of importance of each line segment is performed based on a length of said line segments.

60. The method of claim 59, wherein said evaluating a degree of importance of said line segments further comprises assigning a degree of importance to each line segment in direct proportion to a length of that line segment.

61. The method of claim 42, wherein if two or more line segments are assigned an identical degree of importance, said method further comprises assigning a lowest degree of importance among said two or more line segments to that line segment of said two or more line segments with a shortest length.

62. The method of claim 42, further comprising repeating said steps of evaluating a degree of importance of each line segment; removing an unnecessary line segment; reconfiguring said framework; and reconfiguring said textures or pictures.

63. The method of claim 42, wherein said evaluating a degree of importance of each line segment is performed based on an amount by which an amount of said image data is changed by removal of a particular line segment.

64. The method of claim 42, wherein said evaluating a degree of importance of each line segment is performed based on importance values assigned by a user to one or more of said line segments.

65. The method of claim 64, further comprising specifying one or more of said line segments as of high importance, wherein said evaluating a degree of importance of each line segment further comprises preventing said one or more high importance line segments from being designated as said unnecessary line segment.

66. The method of claim 42, wherein said reconfiguring said framework comprises positioning a vertex at a position such that a total loss of area between a framework including said unnecessary line and a framework in which said unnecessary line segment is removed is minimized.

67. The method of claim 42, wherein said reconfiguring said framework comprises positioning a vertex at a position such that a loss of area to said framework caused by removal of said unnecessary line segment is approximately equal for portions of said framework on opposite sides of said vertex.

68. The method of claim 42, wherein said reconfiguring said framework comprises positioning a new vertex at a position corresponding to an end of said removed unnecessary line segment.

69. The method of claim 42, further comprising, generating an intermediate configuration of said image data by decreasing a length of said unnecessary line segment prior to said step of removing said unnecessary line segment.

70. The method of claim 42, further comprising, generating an intermediate polygonal framework between an original framework including said unnecessary line segment and a new framework with said unnecessary line segment removed.

71. The method of claim 70, wherein said generating an intermediate framework comprises locating a vertex at a position intermediate to a vertex position in said original framework and a vertex position determined in said step of determining a position of a vertex after said unnecessary line segment is removed.

72. The method of claim 71, wherein said locating a vertex at an intermediate position comprises using a linear interpolation on said vertex position in said original framework and said vertex position determined in said step of determining a position of a vertex after said unnecessary line segment is removed.

73. The method of claim 42, wherein said evaluating a degree of importance of each line segment is based in part on an evaluation of a degree of importance of line segments contiguous to a particular line segment being evaluated.

74. The method of claim 42, wherein said reconfiguring said framework comprises using a new vertex to replace a previous vertex located at an end of said unnecessary, removed line segment.

75. The method of claim 42, wherein said reconfiguring said textures or pictures applied to said framework decides a new position of the corresponding point on said textures or pictures where an area change amount of said textures or pictures to be influenced by the approximation lies within a predetermined range.

76. (Amended) The method [apparatus] of claim 44, wherein said reconfiguring of said textures or pictures applied to the framework comprises determining said new position by interpolation between two points on the textures or pictures which correspond to the unnecessary line segment.

77. An apparatus for use with a display device that approximates an image by decreasing an amount of image data used to create the image, wherein said image data defines a polygonal framework, said framework being composed of line segments drawn between vertices, said device comprising:

a memory unit for storing said image data; and

a processor connected to said memory unit, wherein said processor is programmed to:

- (a) assign an importance value to each line segment of said framework;
  - (b) remove from said framework that line segment having a lowest importance value;
- and
- (c) reconfigure said framework to account for said removal of said line segment having said lowest importance value.

78. The apparatus of claim 77, further comprising an input device inputting said image data to said processor for storage in said memory unit.

79. The apparatus of claim 78, wherein said input device comprises a floppy disk drive.

80. The apparatus of claim 78, wherein said input device comprises a magneto-optical disk drive.

81. The apparatus of claim 77, further comprising a user input device for inputting data to said processor.

82. The apparatus of claim 81, wherein said user input device comprises a keyboard.



83. The apparatus of claim 77, wherein said processor is further programmed to reconfigure texture and pictures applied to said framework to account for removal of said line segment.

84. The apparatus of claim 77, said processor, in performing said reconfiguration of said framework, is programmed to replace two vertices of said framework, between which said removed line segment had been connected, with a single new vertex.

85. The apparatus of claim 77, wherein said image data defines a 3-dimensional polygonal framework.

86. The apparatus of claim 77, said processor, in performing said assignment of importance values, is programmed to evaluating an amount by which a volume of the polygonal framework defined by the image data is changed by removal of a particular line segment.

87. The apparatus of claim 86, said processor, in performing said assignment of importance values, is programmed to assign a line segment an importance value in direct proportion to the amount of volume change caused by removal of that line segment.

88. The apparatus of claim 77, said processor, in performing said assignment of importance values, is programmed to use a vector (E) which represents a particular line segment, an area (A) of a polygon within said polygonal framework, wherein said particular line segment is a side of said polygon, and a vector (N) normal to a plane of said polygon.

89. The apparatus of claim 88,

wherein said processor assigns an importance value to each line segment by calculating an importance of a particular line segment by  $(N \cdot E) \times A$ ,

wherein E is said vector representing a particular line segment, A is said area of a polygon sided by said particular line segment, and N is said normal vector.

90. The apparatus of claim 77, said processor, in performing said assignment of importance values, is programmed to determine an amount by which an area of said polygonal framework defined by said image data is changed by removal of a particular line segment.

91. The apparatus of claim 90, wherein said processor assigns an importance value to a particular line segment in direct proportion to said amount by which said area of said polygonal framework is changed by removal of that line segment.

92. The apparatus of claim 77, wherein said processor, in performing said assignment of importance values, assigns an importance value to each line segment based on a length of a particular line segment and an area of a polygon within said polygonal framework of which said particular line segment is a side.

93. The apparatus of claim 77, wherein said processor assigns an importance value to each line segment by calculating a sum of results of an equation  $|E| \times A$  for polygons sided by said particular line segment, wherein " $|E|$ " is length of that line segment, "A" is an area of a polygon sided by said particular line segment.

94. The apparatus of claim 77, wherein said processor, in performing said assignment of importance values, is programmed to assign an importance value to each line segment based on a length of said line segments.

95. The apparatus of claim 77, wherein said processor assigns an importance value to each line segment in direct proportion to a length of that line segment.

96. The apparatus of claim 77, wherein if two or more line segments are assigned an identical degree of importance, said processor assigns a lowest degree of importance among said two or more line segments to that line segment of said two or more line segments with a shortest length.

97. The apparatus of claim 77, wherein said processor is further programmed to repeat said assignment of an importance value to each line segment; said removal of that line segment with the lowest importance value; and said reconfiguration said framework.

98. The apparatus of claim 77, wherein said processor is programmed to assign an importance value to each line segment based on an amount by which an amount of said image data is changed by removal of a particular line segment.

99. The apparatus of claim 77, wherein said processor is programmed to assign an importance value to each line segment based on importance values assigned by a user to one or more of said line segments.

100. The apparatus of claim 77, wherein said processor is programmed to reconfigure said framework by positioning a new vertex at a position such that a total loss of area between a framework including said line segment having said lowest importance value and a framework containing said new vertex and in which said lowest-importance-value line segment is removed is minimized.

101. The apparatus of claim 77, wherein said processor is programmed to reconfigure said framework by positioning a new vertex at a position such that a loss of area to said framework caused by removal of said lowest-importance-value line segment is approximately equal for portions of said framework on opposite sides of said new vertex.

102. The apparatus of claim 77, wherein said processor is programmed to reconfigure said framework by positioning a vertex at a position corresponding to an end of said removed lowest-importance-value line segment.

103. The apparatus of claim 77, wherein said processor is programmed to generate an intermediate configuration of said image data by decreasing a length of said lowest-importance-value line segment.

104. The apparatus of claim 77, wherein said processor is programmed to reconfigure said framework by generating a new vertex to replace a previous vertex located at an end of said removed, lowest-importance-value line segment.

105. A method of approximating an image by decreasing an amount of image data used to create the image, wherein said image data defines a polygonal framework, said framework being composed of line segments drawn between vertices, said method comprising:

assigning an importance value to each line segment of said framework;

removing from said framework that line segment having a lowest importance value;  
and

reconfiguring said framework to account for said removal of said line segment having said lowest importance value.

106. The method of claim 105, wherein said reconfiguring further comprises replacing two vertices of said framework, between which said removed line segment had been connected, with a single new vertex.

107. The method of claim 105, wherein said image data defines a 3-dimensional polygonal framework.

108. The method of claim 105, wherein said assigning an importance value to each line segment is performed by evaluating an amount by which a volume of the polygonal framework defined by the image data is changed by removal of a particular line segment.

109. The method of claim 108, wherein said assigning an importance value to each line segment further comprises assigning a line segment an importance value in direct proportion to the amount of volume change caused by removal of that line segment.

110. The method of claim 105, wherein said assigning an importance value to each line segment is performed using a vector (E) which represents a particular line segment, an area (A) of a polygon within said polygonal framework, wherein said particular line segment is a side of said polygon, and a vector (N) normal to a plane of said polygon.

111. The method of claim 110,

wherein said assigning an importance value to each line segment further comprises calculating an importance of a particular line segment by  $(N \cdot E) \times A$ ,

wherein E is said vector representing a particular line segment, A is said area of a polygon sided by said particular line segment, and N is said normal vector.

112. The method of claim 105, wherein said assigning an importance value to each line segment is performed based on an amount by which an area of said polygonal framework defined by said image data is changed by removal of a particular line segment.

113. The method of claim 112, wherein said assigning an importance value to each line segment further comprises assigning an importance value to a particular line segment in direct proportion to said amount by which said area of said polygonal framework is changed by removal of that line segment.

114. The method of claim 105, wherein said assigning an importance value to each line segment is performed based on a length of a particular line segment and an area of a polygon within said polygonal framework of which said particular line segment is a side.

115. The method of claim 114, wherein said assigning an importance value to each line segment further comprises calculating a sum of results of an equation  $|E| \times A$  for polygons sided by said particular line segment, wherein " $|E|$ " is length of that line segment, "A" is an area of a polygon sided by said particular line segment.

116. The method of claim 105, wherein said assigning an importance value to each line segment is performed based on a length of said line segments.

117. The method of claim 116, wherein said assigning an importance value to each of said line segments further comprises assigning an importance value to each line segment in direct proportion to a length of that line segment.

118. The method of claim 105, wherein if two or more line segments are assigned an identical degree of importance, said method further comprises assigning a lowest degree of importance among said two or more line segments to that line segment of said two or more line segments with a shortest length.

119. The method of claim 105, further comprising repeating said steps of assigning an importance value to each line segment; removing that line segment with the lowest importance value; and reconfiguring said framework.

120. The method of claim 105, wherein said assigning an importance value to each line segment is performed based on an amount by which an amount of said image data is changed by removal of a particular line segment.

121. The method of claim 105, wherein said assigning an importance value to each line segment is performed based on importance values assigned by a user to one or more of said line segments.

122. The method of claim 121, further comprising specifying one or more of said line segments as of high importance, wherein assigning an importance value to each line segment further comprises preventing said one or more high importance line segments from being removed.

123. The method of claim 105, wherein said reconfiguring comprises positioning a new vertex at a position such that a total loss of area between a framework including said line segment having said lowest importance value and a framework comprising said new vertex and in which said lowest-importance-value line segment is removed is minimized.

124. The method of claim 105, wherein said reconfiguring comprises positioning a vertex at a position such that a loss of area to said framework caused by removal of said lowest-importance-value line segment is approximately equal for portions of said framework on opposite sides of said vertex.



125. The method of claim 105, wherein said reconfiguring comprises positioning a vertex at a position corresponding to an end of said removed lowest-importance-value line segment.

126. The method of claim 105, further comprising, generating an intermediate configuration of said image data by decreasing a length of said lowest-importance-value line segment prior to said step of removing said lowest-importance-value line segment.

127. The method of claim 105, further comprising, generating an intermediate polygonal framework between an original framework including said lowest-importance-value line segment and a new reconfigured framework with said lowest-importance-value line segment removed.

128. The method of claim 127, wherein said generating an intermediate framework comprises locating a vertex at a position intermediate to a vertex position in said original framework and a new vertex position determined in said step of reconfiguring.

129. The method of claim 128, wherein said locating a vertex at an intermediate position comprises using a linear interpolation on said vertex position in said original framework and said new vertex position determined in said step of reconfiguring.

130. The method of claim 105, further comprising reconfiguring a texture applied to said framework to account for said removing of said lowest-importance-value line segment.

131. The method of claim 105, wherein said assigning an importance value to each line segment is done in accordance with an assigned importance value of line segments contiguous to a particular line segment being evaluated.

132. The method of claim 105, wherein said reconfiguring comprises using a new vertex to replace a previous vertex located at an end of said removed, lowest-importance-value line segment.

133. The method of claim 105, wherein said assigning an importance value to each line segment comprises deciding that the degree of importance of said line segment is small as said change amount of said volume is small.

134. The method of claim 105, wherein said assigning an importance value to each line segment is performed on the basis of a vector which is representing said line segment, an area of a plane of said image data which is composed by at least one of said vertices of said line segment, and a normal vector at said plane.

135. The method of claim 105, wherein said assigning an importance value to each line segment is performed on the basis of a change amount of area of the image specified by said image data when said line segment is removed.

136. The method of claim 135, wherein said assigning an importance value to each line segment comprises deciding that the degree of importance of said line segment is small as said change amount of said area is small.

137. The method of claim 105, wherein said assigning an importance value to each line segment comprises deciding that the degree of importance of said line segment is small as said length of said line segment is short.

138. The method of claim 105, wherein when two or more edges are assigned an identical degree of importance, a shortest line segment of said line segments receiving an identical degree of importance is said unnecessary edge.

139. The method of claim 105, further comprising repeating the step of said evaluating a degree of importance of the line segment, the step of said removing said unnecessary line segment, and the step of said determining said position of said vertex after said unnecessary line segment is removed.

140. The method of claim 105, wherein said evaluating a degree of said line segment is performed on the basis of a removal importance value of the line segment obtained from a change amount of said image data caused by the removing of said line segment and on the basis of an assigned importance value of the line segment assigned by a user.

141. The method of claim 140, wherein said evaluating a degree of importance of the line segment decides that the degree of importance of said line segment is small, if said removal importance value and said assigned importance value are both small.

142. The method of claim 140, wherein said assigned importance value is a removing order of said line segments.

143. The method of claim 105, further comprising specifying at least one said line segment as of high importance, wherein said evaluating a degree of importance of said at least one line segment further comprises preventing said at least one high importance line segment from being designated as said unnecessary line segment.

144. The method of claim 143, wherein said specifying the at least one line segment as of high importance is performed by a user.

145. The method of claim 143, wherein said specifying the at least one line segment as of high importance specifies a portion where more than two image data are adjacent.

146. The method of claim 105, wherein said vertex is decided at a position where a total loss of area between the original framework which is the framework before line segment removing and the reconfigured framework which is the framework after said line segment removing is minimized.

147. The method of claim 146, wherein when the shape of the portion where said removal line segment is a concave or convex shape, said vertex is decided at a position where a total loss of area between said original framework and said reconfigured framework is minimized.

148. The method of claim 105, wherein said vertex is decided at a position where a loss of area between the original framework which is the framework before line segment removing and the reconfigured framework which is the framework after line segment removing is equal on both sides of said vertex.

149. The method of claim 148, wherein when the shape of the portion where said removal line segment is a S-character shape, said vertex is arranged at a position where a loss of area between said original framework and said reconfigured framework is equal on both sides of said vertex.

150. The method of claim 105, wherein said determining a position of said vertex determines the vertex at a position of one of the vertices of the removal line segment.

151. The method of claim 105, further comprising, generating an intermediate configuration of said image data by decreasing a length of said unnecessary line segment.

152. The method of claim 105, further comprising, generating an framework at intermediate layer between said original framework which is the framework before line segment removing and said reconfigured framework which is the framework after line segment removing by determining a position of vertices in the intermediate layer on the basis of the relation of vertices position between said original framework and said reconfigured framework.

153. The method of claim 105, further comprising reconfiguring a texture applied to said framework to account for said removing of said unnecessary line segment.

154. The method of claim 105, wherein said evaluation of degree of importance of the line segment is performed on the basis of an evaluation value of said line segment and evaluation values of peripheral line segments.

155. The method of claim 105, wherein said removing of unnecessary line segment removes either one or two vertices constructing the unnecessary line segment; and

said determining of a position of vertex determines amount of shift the vertex which is constructing the unnecessary line segment and not removed on said removing of unnecessary line segment.

156. An apparatus for approximating an image by decreasing an amount of image data used to create the image, wherein said image data defines a polygonal framework, said framework being composed of line segments drawn between vertices, said apparatus comprising:

a processing apparatus for:

evaluating a degree of importance of each line segment of said framework;

removing at least one unnecessary line segment from said framework which is identified based on said evaluation of said degree of importance of each line segment; and

determining a position of a vertex after said unnecessary line segment is removed.

157. The apparatus of claim 156, wherein said image data defines a 3-dimensional polygonal framework.

158. The apparatus of claim 156, wherein said evaluating a degree of importance of each line segment is performed by evaluating an amount by which a volume of the polygonal framework defined by the image data is changed by removal of a particular line segment.

159. The apparatus of claim 158, wherein said evaluating a degree of importance of each line segment further comprises assigning a line segment a degree of importance in direct proportion to the amount of volume change caused by removal of that line segment.

160. The apparatus of claim 156, wherein said evaluating a degree of importance of each line segment is performed using a vector (E) which represents a particular line segment, an area (A) of a polygon within said polygonal framework wherein said particular line segment is a side of said polygon, and a vector (N) normal to a plane of said polygon.

161. The apparatus of claim 160,

wherein said evaluating a degree of importance of each line segment further comprises calculating an importance of a particular line segment by  $(N \cdot E) \times A$ ,

wherein E is said vector representing a particular line segment, A is said area of a polygon sided by said particular line segment, and N is said normal vector.

162. The apparatus of claim 156, wherein said evaluating a degree of importance of each line segment is performed based on an amount by which an area of said polygonal framework defined by said image data is changed by removal of a particular line segment.

163. The apparatus of claim 162, wherein said evaluating a degree of importance of each line segment further comprises assigning a degree of importance to a particular line segment in direct proportion to said amount by which said area of said polygonal framework is changed by removal of that line segment.

164. The apparatus of claim 156, wherein said evaluating a degree of importance of each line segment is performed based on a length of a particular line segment and an area of a polygon within said polygonal framework of which said particular line segment is a side.

165. The apparatus of claim 164, wherein said evaluating a degree of importance of each line segment further comprises calculating a sum of results of an equation  $|E| \times A$  for polygons sided by said particular line segment, wherein " $|E|$ " is length of that line segment, "A" is an area of a polygon sided by said particular line segment.

166. The apparatus of claim 156, wherein said evaluating a degree of importance of each line segment is performed based on a length of said line segments.

167. The apparatus of claim 166, wherein said evaluating a degree of importance of said line segments further comprises assigning a degree of importance to each line segment in direct proportion to a length of that line segment.

168. The apparatus of claim 156, wherein if two or more line segments are assigned an identical degree of importance, said processing apparatus assigns a lowest degree of



importance among said two or more line segments to that line segment of said two or more line segments with a shortest length.

169. The apparatus of claim 156, wherein said processing apparatus repeats said evaluating a degree of importance of each line segment; said removing an unnecessary line segment; and said determining a position of a vertex after said unnecessary line segment is removed.

170. The apparatus of claim 156, wherein said evaluating a degree of importance of each line segment is performed based on an amount by which an amount of said image data is changed by removal of a particular line segment.

171. The apparatus of claim 156, wherein said evaluating a degree of importance of each line segment is performed based on importance values assigned by a user to one or more of said line segments.

172. The apparatus of claim 171, said processing apparatus specifies one or more of said line segments as of high importance, wherein said evaluating a degree of importance of each line segment further comprises preventing said one or more high importance line segments from being designated as said unnecessary line segment.

173. The apparatus of claim 156, wherein said determining a position of a vertex after said unnecessary line segment is removed comprises positioning said vertex at said position such

that a total loss of area between a framework including said unnecessary line segment and a framework in which said unnecessary line segment is removed is minimized.

174. The apparatus of claim 156, wherein said determining a position of a vertex after said unnecessary line segment is removed comprises positioning a vertex at a position such that a loss of area to said framework caused by removal of said unnecessary line segment is approximately equal for portions of said framework on opposite sides of said vertex.

175. The apparatus of claim 156, wherein said determining a position of a vertex after said unnecessary line segment is removed comprises positioning said vertex at a position corresponding to an end of said removed unnecessary line segment.

176. The apparatus of claim 156, said processing apparatus generates an intermediate configuration of said image data by decreasing a length of said unnecessary line segment prior to said step of removing said unnecessary line segment.

177. The apparatus of claim 156, said processing apparatus generates an intermediate polygonal framework between an original framework including said unnecessary line segment and a new framework with said unnecessary line segment removed.

178. The apparatus of claim 177, wherein said generating an intermediate framework comprises locating a vertex at a position intermediate to a vertex position in said original framework and a vertex position determined in said step of determining a position of a vertex after said unnecessary line segment is removed.

179. The apparatus of claim 178, wherein said locating a vertex at an intermediate position comprises using a linear interpolation on said vertex position in said original framework and said vertex position determined in said determining a position of a vertex after said unnecessary line segment is removed.

180. The apparatus of claim 156, said processing apparatus reconfigures a texture applied to said framework to account for said removing of said unnecessary line segment.

181. The apparatus of claim 156, wherein said evaluation of a degree of importance of each line segment is based in part on an evaluation of the degree of importance of line segments contiguous to a particular line segment being evaluated.

182. The apparatus of claim 156, said processing apparatus reconfigures said framework after said unnecessary line segment has been removed by placing a new vertex at said position identified in said step of determining a position of a vertex.

183. The apparatus of claim 182, wherein said reconfiguring comprises using said new vertex to replace a previous vertex located at an end of said unnecessary, removed line segment.

184. An apparatus for approximating an image by decreasing an amount of image data used to create the image, wherein said image data defines a polygonal framework formed of

polygons to which textures or pictures are applied, said polygons of said framework being composed of line segments connected between vertices, said apparatus comprising:

a processing apparatus for:

evaluating a degree of importance of each line segment of said framework;

removing an unnecessary line segment identified by said step of evaluating a degree of importance of each line segment;

reconfiguring said framework to account for said removal of said line segment; and

reconfiguring said textures or pictures applied to said framework to account for said removal of said line segment.

185. The apparatus of claim 184, wherein said reconfiguring the textures or pictures applied to the framework is preformed altering an association between a vertex of said unnecessary line segment and any of said textures or pictures.

186. The apparatus of claim 184, wherein:

said reconfiguring of said framework comprises replacing two vertices of said framework, between which said unnecessary, removed line segment had been connected, with a single new vertex; and

said reconfiguring the textures or pictures applied to the framework comprises determining a new position on said textures or pictures corresponding to a position of said single new vertex in said framework.

187. The apparatus of claim 186, wherein said interpolation is a linear interpolation.

188. The apparatus of claim 184, wherein said evaluating a degree of importance of each line segment of said framework further comprises preventing any line segment existing on an outline of any of said textures or pictures from being designated as said unnecessary line segment.

189. The apparatus of claim 184, wherein said evaluating a degree of importance of each line segment of said framework further comprises preventing any line segment, which exists on an outline of any of said textures or pictures from being designated as said unnecessary line segment if a change in an area of said texture or picture resulting from removal of that line segment exceeds a predetermined value.

190. The apparatus of claim 189, wherein said area change amount after the line segment removal is obtained on the basis of a calculation of sum of results of an equation

$$| (N \cdot E) \times L |$$
 at line segments corresponding to the boundary lines of the texture or picture existing before and after the line segment to be removed, wherein "E" is representing that line segment, "L" is a length of line segment corresponding to the boundary lines of the texture or picture, "N" is a normal vector of said line segments, " $\cdot$ " is a inner product, and " $\times$ " is a product.

191. The apparatus of claim 184, wherein said image data defines a 3-dimensional polygonal framework.

192. The apparatus of claim 184, wherein said evaluating a degree of importance of each line segment is performed by evaluating an amount by which a volume of the polygonal framework defined by the image data is changed by removal of a particular line segment.

193. The apparatus of claim 192, wherein said evaluating a degree of importance of each line segment further comprises assigning a line segment a degree of importance in direct proportion to the amount of volume change caused by removal of that line segment.

194. The apparatus of claim 184, wherein said evaluating a degree of importance of each line segment is performed using a vector (E) which represents a particular line segment, an area (A) of a polygon within said polygonal framework wherein said particular line segment is a side of said polygon, and a vector (N) normal to a plane of said polygon.

195. The apparatus of claim 194,

wherein said evaluating a degree of importance of each line segment further comprises calculating an importance of a particular line segment by  $(N \cdot E) \times A$ ,

wherein E is said vector representing a particular line segment, A is said area of a polygon sided by said particular line segment, and N is said normal vector.

196. The apparatus of claim 184, wherein said evaluating a degree of importance of each line segment is performed based on an amount by which an area of said polygonal framework defined by said image data is changed by removal of a particular line segment.

197. The apparatus of claim 196, wherein said evaluating a degree of importance of each line segment further comprises assigning a degree of importance to a particular line segment in direct proportion to said amount by which said area of said polygonal framework is changed by removal of that line segment.

198. The apparatus of claim 184, wherein said evaluating a degree of importance of each line segment is performed based on a length of a particular line segment and an area of a polygon within said polygonal framework of which said particular line segment is a side.

199. The apparatus of claim 198, wherein said evaluating a degree of importance of each line segment further comprises calculating a sum of results of an equation  $|E| \times A$  for polygons sided by said particular line segment, wherein " $|E|$ " is length of that line segment, "A" is an area of a polygon sided by said particular line segment.

200. The apparatus of claim 184, wherein said evaluating a degree of importance of each line segment is performed based on a length of said line segments.

201. The apparatus of claim 200, wherein said evaluating a degree of importance of said line segments further comprises assigning a degree of importance to each line segment in direct proportion to a length of that line segment.

202. The apparatus of claim 184, wherein if two or more line segments are assigned an identical degree of importance, said processing apparatus assigns a lowest degree of

importance among said two or more line segments to that line segment of said two or more line segments with a shortest length.

203. The apparatus of claim 184, said processing apparatus repeats said steps of evaluating a degree of importance of each line segment; removing an unnecessary line segment; reconfiguring said framework; and reconfiguring said textures or pictures.

204. The apparatus of claim 184, wherein said evaluating a degree of importance of each line segment is performed based on an amount by which an amount of said image data is changed by removal of a particular line segment.

205. The apparatus of claim 184, wherein said evaluating a degree of importance of each line segment is performed based on importance values assigned by a user to one or more of said line segments.

206. The apparatus of claim 205, said processing apparatus specifies one or more of said line segments as of high importance, wherein said evaluating a degree of importance of each line segment further comprises preventing said one or more high importance line segments from being designated as said unnecessary line segment.

207. The apparatus of claim 184, wherein said reconfiguring said framework comprises positioning a vertex at a position such that a total loss of area between a framework including said unnecessary line and a framework in which said unnecessary line segment is removed is minimized.



208. The apparatus of claim 184, wherein said reconfiguring said framework comprises positioning a vertex at a position such that a loss of area to said framework caused by removal of said unnecessary line segment is approximately equal for portions of said framework on opposite sides of said vertex.

209. The apparatus of claim 184, wherein said reconfiguring said framework comprises positioning a new vertex at a position corresponding to an end of said removed unnecessary line segment.

210. The apparatus of claim 184, said processing apparatus generates an intermediate configuration of said image data by decreasing a length of said unnecessary line segment prior to said step of removing said unnecessary line segment.

211. The apparatus of claim 184, said processing apparatus generates an intermediate polygonal framework between an original framework including said unnecessary line segment and a new framework with said unnecessary line segment removed.

212. The apparatus of claim 211, wherein said generating an intermediate framework comprises locating a vertex at a position intermediate to a vertex position in said original framework and a vertex position determined in said step of determining a position of a vertex after said unnecessary line segment is removed.

213. The apparatus of claim 212, wherein said locating a vertex at an intermediate position comprises using a linear interpolation on said vertex position in said original framework and said vertex position determined in said determining a position of a vertex after said unnecessary line segment is removed.

214. The apparatus of claim 184, wherein said evaluating a degree of importance of each line segment is based in part on an evaluation of a degree of importance of line segments contiguous to a particular line segment being evaluated.

215. The apparatus of claim 184, wherein said reconfiguring said framework comprises using a new vertex to replace a previous vertex located at an end of said unnecessary, removed line segment.

216. A medium for storing image data for approximating an image by decreasing an amount of said image data used to create the image, wherein said image data defines a polygonal framework, said framework being composed of line segments drawn between vertices, said medium comprising:

a memory unit for storing said image data, wherein said image data stored onto said memory unit are generated by:

evaluating a degree of importance of each line segment of said framework;

removing at least one unnecessary line segment from said framework which is identified based on said evaluation of said degree of importance of each line segment; and

determining a position of a vertex after said unnecessary line segment is removed.

217. The medium of claim 216, wherein said image data defines a 3-dimensional polygonal framework.

218. The medium of claim 216, wherein said evaluating a degree of importance of each line segment is performed by evaluating an amount by which a volume of the polygonal framework defined by the image data is changed by removal of a particular line segment.

219. The medium of claim 218, wherein said evaluating a degree of importance of each line segment further comprises assigning a line segment a degree of importance in direct proportion to the amount of volume change caused by removal of that line segment.

220. The medium of claim 216, wherein said evaluating a degree of importance of each line segment is performed using a vector (E) which represents a particular line segment, an area (A) of a polygon within said polygonal framework wherein said particular line segment is a side of said polygon, and a vector (N) normal to a plane of said polygon.

221. The medium of claim 220,

wherein said evaluating a degree of importance of each line segment further comprises calculating an importance of a particular line segment by  $(N \cdot E) \times A$ ,

wherein E is said vector representing a particular line segment, A is said area of a polygon sided by said particular line segment, and N is said normal vector.

222. The medium of claim 216, wherein said evaluating a degree of importance of each line segment is performed based on an amount by which an area of said polygonal framework defined by said image data is changed by removal of a particular line segment.

223. The medium of claim 222, wherein said evaluating a degree of importance of each line segment further comprises assigning a degree of importance to a particular line segment in direct proportion to said amount by which said area of said polygonal framework is changed by removal of that line segment.

224. The medium of claim 216, wherein said evaluating a degree of importance of each line segment is performed based on a length of a particular line segment and an area of a polygon within said polygonal framework of which said particular line segment is a side.

225. The medium of claim 224, wherein said evaluating a degree of importance of each line segment further comprises calculating a sum of results of an equation  $|E| \times A$  for polygons sided by said particular line segment, wherein " $|E|$ " is length of that line segment, "A" is an area of a polygon sided by said particular line segment.

226. The medium of claim 216, wherein said evaluating a degree of importance of each line segment is performed based on a length of said line segments.

227. The medium of claim 226, wherein said evaluating a degree of importance of said line segments further comprises assigning a degree of importance to each line segment in direct proportion to a length of that line segment.

228. The medium of claim 216, wherein if two or more line segments are assigned an identical degree of importance, a lowest degree of importance among said two or more line segments is assigned to that line segment of said two or more line segments with a shortest length.

229. The medium of claim 216, further comprising repeating said evaluating a degree of importance of each line segment; said removing an unnecessary line segment; and said determining a position of a vertex after said unnecessary line segment is removed.

230. The medium of claim 216, wherein said evaluating a degree of importance of each line segment is performed based on an amount by which an amount of said image data is changed by removal of a particular line segment.

231. The medium of claim 216, wherein said evaluating a degree of importance of each line segment is performed based on importance values assigned by a user to one or more of said line segments.

232. The medium of claim 231, further comprising specifying one or more of said line segments as of high importance, wherein said evaluating a degree of importance of each line segment further comprises preventing said one or more high importance line segments from being designated as said unnecessary line segment.

233. The medium of claim 216, wherein said determining a position of a vertex after said unnecessary line segment is removed comprises positioning said vertex at said position such that a total loss of area between a framework including said unnecessary line segment and a framework in which said unnecessary line segment is removed is minimized.

234. The medium of claim 216, wherein said determining a position of a vertex after said unnecessary line segment is removed comprises positioning a vertex at a position such that a loss of area to said framework caused by removal of said unnecessary line segment is approximately equal for portions of said framework on opposite sides of said vertex.

235. The medium of claim 216, wherein said determining a position of a vertex after said unnecessary line segment is removed comprises positioning said vertex at a position corresponding to an end of said removed unnecessary line segment.

236. The medium of claim 216, wherein an intermediate configuration of said image data is generated by decreasing a length of said unnecessary line segment prior to said removing said unnecessary line segment.

237. The medium of claim 216, wherein an intermediate polygonal framework is generated between an original framework including said unnecessary line segment and a new framework with said unnecessary line segment removed.

238. The medium of claim 237, wherein said generating an intermediate framework comprises locating a vertex at a position intermediate to a vertex position in said original

framework and a vertex position determined in said determining a position of a vertex after said unnecessary line segment is removed.

239. The medium of claim 238, wherein said locating a vertex at an intermediate position comprises using a linear interpolation on said vertex position in said original framework and said vertex position determined in said determining a position of a vertex after said unnecessary line segment is removed.

240. The medium of claim 216, further comprising reconfiguring a texture applied to said framework to account for said removing of said unnecessary line segment.

241. The medium of claim 216, wherein said evaluation of a degree of importance of each line segment is based in part on an evaluation of the degree of importance of line segments contiguous to a particular line segment being evaluated.

242. The medium of claim 216, further comprising reconfiguring said framework after said unnecessary line segment has been removed by placing a new vertex at said position identified in said determining a position of a vertex.

243. The medium of claim 242, wherein said reconfiguring comprises using said new vertex to replace a previous vertex located at an end of said unnecessary, removed line segment.

244. A medium for storing image data for approximating an image by decreasing an amount of image data used to create the image, wherein said image data defines a polygonal framework, said framework being composed of line segments drawn between vertices, said medium comprising:

a memory unit for storing said image data, wherein said image data stored onto said memory unit are generated by:

assigning an importance value to each line segment of said framework;

removing from said framework that line segment having a lowest importance value;

and

reconfiguring said framework to account for said removal of said line segment having said lowest importance value.

245. The medium of claim 244, wherein said reconfiguring further comprises replacing two vertices of said framework, between which said removed line segment had been connected, with a single new vertex.

246. The medium of claim 244, wherein said image data defines a 3-dimensional polygonal framework.

247. The medium of claim 244, wherein said assigning an importance value to each line segment is performed by evaluating an amount by which a volume of the polygonal framework defined by the image data is changed by removal of a particular line segment.



248. The medium of claim 247, wherein said assigning an importance value to each line segment further comprises assigning a line segment an importance value in direct proportion to the amount of volume change caused by removal of that line segment.

249. The medium of claim 244, wherein said assigning an importance value to each line segment is performed using a vector (E) which represents a particular line segment, an area (A) of a polygon within said polygonal framework, wherein said particular line segment is a side of said polygon, and a vector (N) normal to a plane of said polygon.

250. The medium of claim 249,

wherein said assigning an importance value to each line segment further comprises calculating an importance of a particular line segment by  $(N \cdot E) \times A$ ,

wherein E is said vector representing a particular line segment, A is said area of a polygon sided by said particular line segment, and N is said normal vector.

251. The medium of claim 244, wherein said assigning an importance value to each line segment is performed based on an amount by which an area of said polygonal framework defined by said image data is changed by removal of a particular line segment.

252. The medium of claim 251, wherein said assigning an importance value to each line segment further comprises assigning an importance value to a particular line segment in direct proportion to said amount by which said area of said polygonal framework is changed by removal of that line segment.

253. The medium of claim 244, wherein said assigning an importance value to each line segment is performed based on a length of a particular line segment and an area of a polygon within said polygonal framework of which said particular line segment is a side.

254. The medium of claim 252, wherein said assigning an importance value to each line segment further comprises calculating a sum of results of an equation  $|E| \times A$  for polygons sided by said particular line segment, wherein " $|E|$ " is length of that line segment, "A" is an area of a polygon sided by said particular line segment.

255. The medium of claim 244, wherein said assigning an importance value to each line segment is performed based on a length of said line segments.

256. The medium of claim 255, wherein said assigning an importance value to each of said line segments further comprises assigning an importance value to each line segment in direct proportion to a length of that line segment.

257. The medium of claim 244, wherein if two or more line segments are assigned an identical degree of importance, a lowest degree of importance is assigned among said two or more line segments to that line segment of said two or more line segments with a shortest length.

258. The medium of claim 244, further comprising repeating said steps of assigning an importance value to each line segment; removing that line segment with the lowest importance value; and reconfiguring said framework.

259. The medium of claim 244, wherein said assigning an importance value to each line segment is performed based on an amount by which an amount of said image data is changed by removal of a particular line segment.

260. The medium of claim 244, wherein said assigning an importance value to each line segment is performed based on importance values assigned by a user to one or more of said line segments.

261. The medium of claim 260, further comprising specifying one or more of said line segments as of high importance, wherein assigning an importance value to each line segment further comprises preventing said one or more high importance line segments from being removed.

262. The medium of claim 244, wherein said reconfiguring comprises positioning a new vertex at a position such that a total loss of area between a framework including said line segment having said lowest importance value and a framework comprising said new vertex and in which said lowest-importance-value line segment is removed is minimized.

263. The medium of claim 244, wherein said reconfiguring comprises positioning a vertex at a position such that a loss of area to said framework caused by removal of said lowest-importance-value line segment is approximately equal for portions of said framework on opposite sides of said vertex.

264. The medium of claim 244, wherein said reconfiguring comprises positioning a vertex at a position corresponding to an end of said removed lowest-importance-value line segment.

265. The medium of claim 244, wherein an intermediate configuration of said image data is generated by decreasing a length of said lowest-importance-value line segment prior to said removing said lowest-importance-value line segment.

266. The medium of claim 244, wherein an intermediate polygonal framework is generated between an original framework including said lowest-importance-value line segment and a new reconfigured framework with said lowest-importance-value line segment removed.

267. The medium of claim 266, wherein said generating an intermediate framework comprises locating a vertex at a position intermediate to a vertex position in said original framework and a new vertex position determined in said reconfiguring.

268. The medium of claim 267, wherein said locating a vertex at an intermediate position comprises using a linear interpolation on said vertex position in said original framework and said new vertex position determined in said reconfiguring.

269. The medium of claim 244, wherein a texture applied to said framework is reconfigured to account for said removing of said lowest-importance-value line segment.

270. The medium of claim 244, wherein said assigning an importance value to each line segment is done in accordance with an assigned importance value of line segments contiguous to a particular line segment being evaluated.

271. The medium of claim 244, wherein said reconfiguring comprises using a new vertex to replace a previous vertex located at an end of said removed, lowest-importance-value line segment.

272. A medium for storing image data for approximating an image by decreasing an amount of image data used to create the image, wherein said image data defines a polygonal framework formed of polygons to which textures or pictures are applied, said polygons of said framework being composed of line segments connected between vertices, said medium comprising:

a memory unit for storing said image data, wherein said image data stored onto said memory unit are generated by:

evaluating a degree of importance of each line segment of said framework;

removing an unnecessary line segment identified by said evaluating a degree of importance of each line segment;

reconfiguring said framework to account for said removal of said line segment; and

reconfiguring said textures or pictures applied to said framework to account for said removal of said line segment.

273. The medium of claim 272, wherein said reconfiguring the textures or pictures applied to the framework is preformed altering an association between a vertex of said unnecessary line segment and any of said textures or pictures.

274. The medium of claim 272, wherein:

said reconfiguring of said framework comprises replacing two vertices of said framework, between which said unnecessary, removed line segment had been connected, with a single new vertex; and

said reconfiguring the textures or pictures applied to the framework comprises determining a new position on said textures or pictures corresponding to a position of said single new vertex in said framework.

275. The medium of claim 274, wherein said reconfiguring of said textures or pictures applied to the framework comprises determining said new position by interpolation between two points on the textures or pictures which correspond to the unnecessary line segment.

276. The medium of claim 275, wherein said interpolation is a linear interpolation.

277. The medium of claim 272, wherein said evaluating a degree of importance of each line segment of said framework further comprises preventing any line segment existing on an outline of any of said textures or pictures from being designated as said unnecessary line segment.

278. The medium of claim 272, wherein said evaluating a degree of importance of each line segment of said framework further comprises preventing any line segment, which exists on an outline of any of said textures or pictures from being designated as said unnecessary line segment if a change in an area of said texture or picture resulting from removal of that line segment exceeds a predetermined value.

279. The medium of claim 278, wherein said area change amount after the line segment removal is obtained on the basis of a calculation of sum of results of an equation

$| (N \cdot E) \times L |$  at line segments corresponding to the boundary lines of the texture or picture existing before and after the line segment to be removed, wherein "E" is representing that line segment, "L" is a length of line segment corresponding to the boundary lines of the texture or picture, "N" is a normal vector of said line segments, " $\cdot$ " is a inner product, and " $\times$ " is a product.

280. The medium of claim 272, wherein said image data defines a 3-dimensional polygonal framework.

281. The medium of claim 272, wherein said evaluating a degree of importance of each line segment is performed by evaluating an amount by which a volume of the polygonal framework defined by the image data is changed by removal of a particular line segment.

282. The medium of claim 281, wherein said evaluating a degree of importance of each line segment further comprises assigning a line segment a degree of importance in direct proportion to the amount of volume change caused by removal of that line segment.

283. The medium of claim 272, wherein said evaluating a degree of importance of each line segment is performed using a vector (E) which represents a particular line segment, an area (A) of a polygon within said polygonal framework wherein said particular line segment is a side of said polygon, and a vector (N) normal to a plane of said polygon.

284. The medium of claim 283,

wherein said evaluating a degree of importance of each line segment further comprises calculating an importance of a particular line segment by  $(N \cdot E) \times A$ ,

wherein E is said vector representing a particular line segment, A is said area of a polygon sided by said particular line segment, and N is said normal vector.

285. The medium of claim 272, wherein said evaluating a degree of importance of each line segment is performed based on an amount by which an area of said polygonal framework defined by said image data is changed by removal of a particular line segment.

286. The medium of claim 285, wherein said evaluating a degree of importance of each line segment further comprises assigning a degree of importance to a particular line segment in direct proportion to said amount by which said area of said polygonal framework is changed by removal of that line segment.

287. The medium of claim 272, wherein said evaluating a degree of importance of each line segment is performed based on a length of a particular line segment and an area of a polygon within said polygonal framework of which said particular line segment is a side.



288. The medium of claim 287, wherein said evaluating a degree of importance of each line segment further comprises calculating a sum of results of an equation  $|E| \times A$  for polygons sided by said particular line segment, wherein " $|E|$ " is length of that line segment, "A" is an area of a polygon sided by said particular line segment.

289. The medium of claim 272, wherein said evaluating a degree of importance of each line segment is performed based on a length of said line segments.

290. The medium of claim 289, wherein said evaluating a degree of importance of said line segments further comprises assigning a degree of importance to each line segment in direct proportion to a length of that line segment.

291. The medium of claim 272, wherein if two or more line segments are assigned an identical degree of importance, a lowest degree of importance is assigned among said two or more line segments to that line segment of said two or more line segments with a shortest length.

292. The medium of claim 272, further comprising repeating said steps of evaluating a degree of importance of each line segment; removing an unnecessary line segment; reconfiguring said framework; and reconfiguring said textures or pictures.

293. The medium of claim 272, wherein said evaluating a degree of importance of each line segment is performed based on an amount by which an amount of said image data is changed by removal of a particular line segment.

294. The medium of claim 272, wherein said evaluating a degree of importance of each line segment is performed based on importance values assigned by a user to one or more of said line segments.

295. The medium of claim 294, one or more of said line segments is specified as of high importance, wherein said evaluating a degree of importance of each line segment further comprises preventing said one or more high importance line segments from being designated as said unnecessary line segment.

296. The medium of claim 272, wherein said reconfiguring said framework comprises positioning a vertex at a position such that a total loss of area between a framework including said unnecessary line and a framework in which said unnecessary line segment is removed is minimized.

297. The medium of claim 272, wherein said reconfiguring said framework comprises positioning a vertex at a position such that a loss of area to said framework caused by removal of said unnecessary line segment is approximately equal for portions of said framework on opposite sides of said vertex.

298. The medium of claim 272, wherein said reconfiguring said framework comprises positioning a new vertex at a position corresponding to an end of said removed unnecessary line segment.

299. The medium of claim 272, wherein an intermediate configuration of said image data is generated by decreasing a length of said unnecessary line segment prior to said removing said unnecessary line segment.

300. The medium of claim 272, wherein an intermediate polygonal framework between an original framework is generated to include said unnecessary line segment and a new framework with said unnecessary line segment removed.

301. The medium of claim 300, wherein said generating an intermediate framework comprises locating a vertex at a position intermediate to a vertex position in said original framework and a vertex position determined in said determining a position of a vertex after said unnecessary line segment is removed.

302. The medium of claim 301, wherein said locating a vertex at an intermediate position comprises using a linear interpolation on said vertex position in said original framework and said vertex position determined in said determining a position of a vertex after said unnecessary line segment is removed.

303. (Amended) The medium of claim 272, [ wherein ] wherein said evaluating a degree of importance of each line segment is based in part on an evaluation of a degree of importance of line segments contiguous to a particular line segment being evaluated.

304. The medium of claim 272, wherein said reconfiguring said framework comprises using a new vertex to replace a previous vertex located at an end of said unnecessary, removed line segment.

305. A method of approximating an image by decreasing an amount of image data used to create the image, wherein said image data defines a polygonal framework, said framework being composed of line segments drawn between vertices, said method comprising:

evaluating each line segment of said framework;

identifying at least one line segment from said framework which is identified based on said evaluation of each line segment;

determining a position of a new vertex to which vertices composing the identified line segment are integrated;

integrating the vertices composing the identified line segment to the new vertex; and

assigning a weight which is considered in the evaluating step or the identifying step to reflect a user's intention in the approximated image.

306. The method of claim 305, further comprising the steps of:

storing data relating to said integrated vertices; and

using the stored data for forming a model finer than the approximated image.

307. A method for creating data which comprises approximated image data formed by decreasing an amount of original image data, wherein said approximated and original image

data define a polygonal framework, said framework being composed of line segments drawn between vertices, said method comprising:

forming said approximated image data from said original image data, wherein the forming step comprises:

evaluating each line segment of said framework;

identifying at least one line segment from said framework which is identified based on said evaluation of each line segment;

determining a position of a new vertex to which vertices composing the identified line segment are integrated, and

integrating the vertices composing the identified line segment to the new vertex; and

storing said approximated image data.

308. The method of claim 307, further comprising the step of storing data relating said vertices integrated to said new vertex for use in forming a model finer than said approximated image data by using the stored data relating to said vertices.

309. The method of claim 308, further comprising the step of assigning a weight which is considered in the evaluating step or the identifying step to reflect a user's intention in the approximated image.

310. A method of forming a finer model from the data created by the method of claim 308, wherein the finer model is formed by using said approximated image data and said data relating said vertices integrated to said new vertex.

Please add the following new claims.

311. A method of forming finer model from image data created by an approximated image data creation, wherein:

(a) the image data created by said approximated image data creation comprising approximated image data formed by decreasing an amount of original image data, wherein said approximated and original image data define a polygonal framework, said framework being composed of line segments drawn between vertices; and

(b) said approximated image data creation comprising:

(b-1) forming said approximated image data from said original image data, wherein the step (b-1) of forming said approximated image data comprises:

(b-1-1) evaluating each line segment of said framework;

(b-1-2) identifying at least one segment from said framework which is identified based on said evaluation of each line segment;

(b-1-3) determining a position of an integrated vertex to which vertices composing the identified line segment are integrated;

(b-1-4) integrating the vertices defining the identified line segment to the integrated new vertex;

(b-2) storing said approximated image data; and

(b-3) storing additional data relating said vertices integrated to said new vertex for use in forming a model finer than said approximated image data by using the stored data relating to said vertices;

(c) forming the finer model by using said approximated image data and said additional data, the step (c) of forming the finer model comprises:

(c-1) creating two vertices comprised in said finer model from said integrated vertex by using data included in said additional data.

312. A forming method of claim 311, wherein

said forming step (c) further comprising:

(c-2) allotting a texture to a face created by said creating step (c-1) of said two vertices.

313. A forming method of claim 311, wherein

said finer model having one or more vertices and two or more faces than does said approximated image data.

314. A forming method of claim 311, wherein

said polygonal framework being represented using triangle meshes.

315. A forming method of claim 311, wherein

said identifying step (b-1-2), said determining step (b-1-3), and said integrating step (b-1-4) are repeated in said approximated image data creation so that said approximated data have a desired resolution.

316. A forming method of claim 311, wherein

said additional data comprising information of integration relations of said integrated vertex and deleted vertices in said original image data.

317. A forming method of claim 311, wherein

in said creating step (c-1),

one of said two vertices is created by modifying the position of said integrated vertex based on information comprised in said additional data, and

the other is created by modifying the position of said integrated vertex based on information comprised in said additional data.

318. A forming method of claim 311, wherein

a plurality of said finer image data can be formed from said approximated image data, wherein

one of the finer image data has resolution which is different from resolution of another of the finer image data.

319. A forming method of claim 311, wherein



in said forming step (c), the creating step (c-1) for creating of said two vertices comprised in said finer model is repeated in order to be executed on a plurality of integrated vertices of said approximated image data.

**STATUS AND SUPPORT FOR ALL CHANGES TO THE CLAIMS**

The following statement of the status and support for all changes to the claims in this reissue application is provided to comply with 37 C.F.R. §1.173(c) and to facilitate consideration of this reissue application.

Claims 1-14 were issued in the original patent, and remain pending in this reissue application.

Claim 15 has been amended by the *Preliminary Amendment And Statement Of Status/Support For All Changes To The Claims* filed on February 19, 2004. An explanation of the support in the disclosure of the patent for the changes made to claim 15 is found within the Preliminary Amendment of February 19, 2004.

Claims 15-22 were issued in the original patent, and remain pending in this reissue application.

Claim 23 has been amended by the *Preliminary Amendment And Statement Of Status/Support For All Changes To The Claims* filed on February 19, 2004. An explanation of the support in the disclosure of the patent for the changes made to claim 23 is found within the Amendment of February 19, 2004.

Claims 24-75 were issued in the original patent, and remain pending in this reissue application.

Claim 76 has been amended by the *Preliminary Amendment And Statement Of Status/Support For All Changes To The Claims* filed on February 19, 2004. An explanation of the support in the disclosure of the patent for the changes made to claim 76 is found within the Preliminary Amendment of February 19, 2004.

Claims 77-154 were issued in the original patent, and remain pending in this reissue application.

Claim 155 was amended by the Certificate of Correction of October 14, 2003, and remains pending in this reissue application. Where a certificate of correction has issued for the patent, an amendment in the reissue application must be presented as if the changes made to the original patent text via the certificate of correction are a part of the original patent. M.P.E.P. §1453.

Claims 156-278 were issued in the original patent, and remain pending in this reissue application.

Claim 279 was amended by the Certificate of Correction of October 14, 2003, and remains pending in this reissue application. Where a certificate of correction has issued for the patent, an amendment in the reissue application must be presented as if the changes made to the original patent text via the certificate of correction are a part of the original patent. M.P.E.P. §1453.

Claims 280-302 were issued in the original patent, and remain pending in this reissue application.

Claim 303 was amended to correct a typographical rejection in that claim.

Claim 302 was amended by the Certificate of Correction of October 14, 2003, and remains pending in this reissue application. Where a certificate of correction has issued for the patent, an amendment in the reissue application must be presented as if the changes made to the original patent text via the certificate of correction are a part of the original patent. M.P.E.P. §1453.

Claim 304 was issued in the original patent, and remains pending in this reissue application.

Claims 305-310 have been added by the *Preliminary Amendment And Statement Of Status/Support For All Changes To The Claims* filed on February 19, 2004. An explanation of the support in the disclosure of the patent for the addition of claims 305-310 is found within the Amendment of February 19, 2004.

New claims 311-319 have been added by this amendment to claim additional subject matter to which the Applicants are believed to be entitled. These claims are broader in some aspects, and narrower in some aspects, as compared to the issued claims of the '952 patent. An explanation of the support in the disclosure of the patent for each element of the new claims 305 to 310 is provided in the following chart:

New Claim 311	Support in '952 Patent for Claim Changes
<u>311. A method of forming finer model from image data created by an approximated image data creation, wherein:</u>	
<u>(a) the image data created by said approximated image data creation comprising approximated image data formed by decreasing an amount of original image data, wherein said approximated and original image data define a polygonal framework, said framework being composed of line segments drawn between vertices; and</u>	Figures 1, 3A; column 5, lines 1-8
<u>(b) said approximated image data creation comprising:</u>	Figure 1; Steps S2-S6
<u>(b-1) forming said approximated image data from said original image data, wherein the step (b-1) of forming said approximated image data comprises:</u>	Figure 1; Steps S2-S6
<u>(b-1-1) evaluating each line segment of said framework;</u>	Figure 1; Step S2 column 5, lines 17-18; column 6, line 6 to column 7, line 30
<u>(b-1-2) identifying at least one segment from said framework which is identified based on</u>	Figure 1; Step S3; column 5, lines 21-24;

<u>said evaluation of each line segment:</u>	column 7, lines 30-40
<u>(b-1-3) determining a position of an integrated vertex to which vertices composing the identified line segment are integrated:</u>	Figures 1, 4A, 4B, 6A, 7A; Step S5; column 7, line 52 to column 8, line 58; column 9, lines 12-47
<u>(b-1-4) integrating the vertices defining the identified line segment to the integrated new vertex:</u>	Figures 1, 4A, 4B, 6A, 7A; Step S5; column 7, line 52 to column 8, line 58; column 9, lines 12-47
<u>(b-2) storing said approximated image data; and</u>	Column 5, lines 48-54; column 11, lines 43-48
<u>(b-3) storing additional data relating said vertices integrated to said new vertex for use in forming a model finer than said approximated image data by using the stored data relating to said vertices:</u>	Column 12, lines 20-50
<u>(c) forming the finer model by using said approximated image data and said additional data, the step (c) of forming the finer model comprises:</u>	Figures 1, 11A, 11B, 11C, column 8, line 59 to column 11, line 42; column 12, lines 20-50
<u>(c-1) creating two vertices comprised in said finer model from said integrated vertex by using data included in said additional data.</u>	Figures 1, 11A, 11B, 11C, column 8, line 59 to column 11, line 42; column 12, lines 20-50

New Claim 312	Support in '952 Patent for Claim Changes
<u>312. A forming method of claim 311, wherein</u>  <u>said forming step (c) further comprising:</u>	See, for example, claim 311
<u>(c-2) allotting a texture to a face created by</u> <u>said creating step (c-1) of said two vertices.</u>	Figures 1, 6B, 10, Step S6; column 9, lines 3-11; column 10, line 47 to column 11, line 42

New Claim 313	Support in '952 Patent for Claim Changes
<u>313. A forming method of claim 311, wherein</u>	See, for example, claim 311
<u>said finer model having one or more vertices</u> <u>and two or more faces than does said</u> <u>approximated image data.</u>	Figures 4A, 4B

New Claim 314	Support in '952 Patent for Claim Changes
<u>314. A forming method of claim 311, wherein</u>	See, for example, claim 311
<u>said polygonal framework being represented</u> <u>using triangle meshes.</u>	Figure 3A

New Claim 315	Support in '952 Patent for Claim Changes
<u>315. A forming method of claim 311, wherein</u>	See, for example, claim 311

<u>said identifying step (b-1-2), said determining step (b-1-3), and said integrating step (b-1-4) are repeated in said approximated image data creation so that said approximated data have a desired resolution.</u>	Column 5, lines 61-62
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New Claim 316	Support in '952 Patent for Claim Changes
<u>316. A forming method of claim 311, wherein</u>	See, for example, claim 311
<u>said additional data comprising information of integration relations of said integrated vertex and deleted vertices in said original image data.</u>	Column 12, lines 20-50

<b>New Claim 317</b>	<b>Support in '952 Patent for Claim Changes</b>
<u>317. A forming method of claim 311, wherein</u>	See, for example, claim 311
<u>in said creating step (c-1),</u>	
<u>one of said two vertices is created by</u>	Figures 11A, 11B, 11C; Column 12, lines 20-50
<u>modifying the position of said integrated</u>	
<u>vertex based on information comprised in said</u>	
<u>additional data, and</u>	
<u>the other is created by modifying the position</u>	Figures 11A, 11B, 11C; Column 12, lines 20-50
<u>of said integrated vertex based on information</u>	
<u>comprised in said additional data.</u>	

<b>New Claim 318</b>	<b>Support in '952 Patent for Claim Changes</b>
<u>318. A forming method of claim 311, wherein</u>	See, for example, claim 311
<u>a plurality of said finer image data can be</u>	Figures 12, 13; column 13, lines 13-67
<u>formed from said approximated image data,</u>	
<u>wherein</u>	
<u>one of the finer image data has resolution</u>	
<u>which is different from resolution of another of</u>	
<u>the finer image data.</u>	

<b>New Claim 319</b>	<b>Support in '952 Patent for Claim Changes</b>
<u>319. A forming method of claim 311, wherein</u>	See, for example, claim 311



<u>in said forming step (c), the creating step (c-1)</u> <u>for creating of said two vertices comprised in</u> <u>said finer model is repeated in order to be</u> <u>executed on a plurality of integrated vertices of</u> <u>said approximated image data.</u>	Column 12, lines 52-54
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The specification was also amended to correct typographical errors introduced during the issuance of the '952 Patent. Support for these changes to the specification is found, for example, in the corresponding parts of the specification. All amendments to the specification have been presented in the form of rewritten paragraphs with changes shown by brackets and underlining, in accordance with 37 C.F.R. §1.173(b).

In light of these amendments and the accompanying remarks, prompt and favorable examination of this reissue application is respectfully requested.